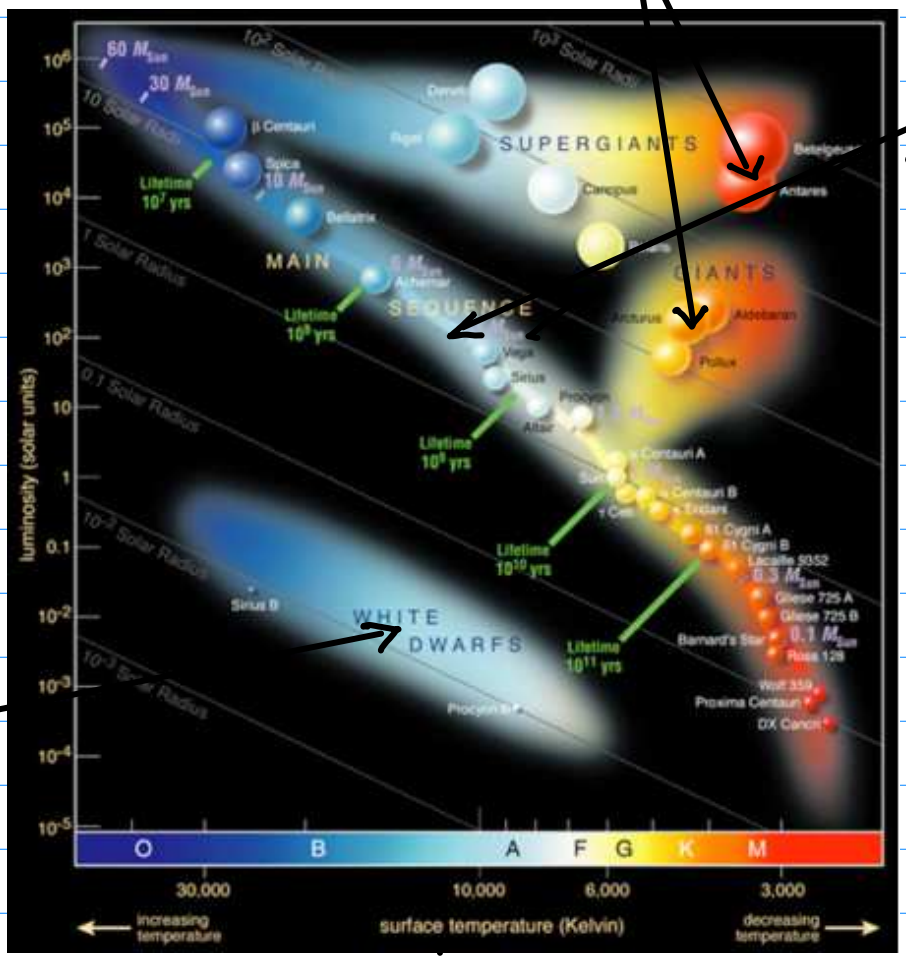
STELLAR FORMATION AND EVOLUTION

TO FIND OUT ABOUT THE STAR FORMATION WE NEED TO LOOK AT THE NEIGHBORHOODS OF YOUNG STARS. WHERE TO FIND THE YOUNGEST STARS? RECALL THE H-R DIAGRAM:

RED GIANTS/SUPERGIANTS



MAIN SEQUENCE STARS (OVER 90% OF ALL STARS ARE IN THIS GROUP)

L ↑

WHITE DWARFS

T (SPECTRAL CLASS) →

$$\text{LIFETIME OF A STAR} = \frac{\text{FUEL AVAILABLE } (M)}{\text{ENERGY OUTPUT } (L)} = \frac{M}{L}$$

(M: MASS; L: LUMINOSITY)

$$\propto \frac{M}{M^{3.5}} = \frac{1}{M^{2.5}}$$

FOR MAIN SEQUENCE STARS $L \propto M^{3.5}$

HENCE, THE LARGER THE MASS, THE SHORTER IS THE LIFETIME.

THEREFORE, THE YOUNGEST STARS ARE IN THE UPPER LEFT CORNER OF THE MAIN SEQUENCE — VERY LUMINOUS AND VERY HOT (O- AND B- SPECTRAL CLASS) STARS. WHEN WE VIEW THEM WE FIND THAT THEY ARE SURROUNDED BY CLOUDS OF GAS (BY MASS: 75% H AND 25% He) AND DUST (SMALL SOLID PARTICLES):

WHEN WE CAN OBSERVE THESE CLOUDS AT VISIBLE WAVELENGTHS (FROM 400 nm TO 700 nm, 1 nm = $= 10^{-9}$ m) WE CALL THEM <u>NEBULAE</u>.